CEMENTITIOUS ARTICLE AND METHOD FOR PREPARING THE SAME

BACKGROUND OF THE INVENTION

In many types of cementitious articles, set gypsum (calcium sulfate dihydrate) is often a major constituent. For example, set gypsum is a major component of end products created by use of traditional plasters (e.g., plaster-surfaced internal building walls), and also in faced gypsum board employed in typical drywall construction of interior walls and ceilings of buildings. In addition, set gypsum is the major component of gypsum/cellulose fiber composite boards and products, as described in U.S. Pat. No. 5,320,677. Set gypsum is also included in products that fill and smooth the joints between edges of gypsum board (see, e.g., U.S. Pat. No. 3,297,601). Also, many specialty materials, such as materials useful for modeling and mold-making that are precisely machined, produce products that contain major amounts of set gypsum. Typically, such gypsum-containing cementitious products are made by preparing a mixture of calcined gypsum (calcium sulfate alpha or beta hemihydrate and/or calcium sulfate anhydrite), water, and other components, as appropriate to form a cementitious slurry. In the manufacture of cementitious articles, the cementitious slurry and desired additives are often blended in a continuous mixer, as for example described in U.S. Pat. No. 3,359,146.

The mixture is cast into a desired shape or onto a surface, and then allowed to harden to form set (i.e., rehydrated) gypsum by reaction of the calcined gypsum with water to form a matrix of crystalline hydrated gypsum (calcium sulfate dihydrate). It is the desired hydration of the calcined gypsum that enables the formation of an interlocking matrix of set gypsum crystals, thereby imparting strength to the gypsum structure in the gypsum containing product. Mild heating is utilized to drive off the remaining (i.e., unreacted) water to yield a dry product.

Cementitious products, while generally durable, can nevertheless be improved by enhancing the strength (e.g., compressive strength) thereof to make them more resistant to stresses encountered during use. For example, many cementitious products can be susceptible to indentations or other damage during wear and tear.

In the case of cementitious board, they are manufactured such that a layer of mixed cementitious slurry is continuously deposited on a sheet of facer material moving beneath the mixer. A second sheet of facer material is usually applied to the top of the slurry. The cementitious slurry sandwiched between the two facer materials is allowed to at least partially set prior to being subjected to further processing, such as cutting the board to desired length, and heating to evaporate residual excess water.

The facer materials include paper in some applications, such as in the case of conventional wallboard. While paper adheres to the cementitious component of the wallboard with relative ease, one drawback with paper is that it is less resistant to moisture. Thus, particularly in applications where water resistance is desirable, other facer materials, such as fibrous mats (including meshes), can be used. While such facer materials provide better moisture resistance properties, they may not be fully satisfactory because they may lack interfacial adhesive strength between the cementitious component and the facer material that may otherwise be achieved when a paper facer material is used. A cementitious component formulation that enables enhanced interfacial adhesion to facer materials is desirable to thereby improve the performance of the finished product.

Thus, there is a need for cementitious articles with improved strength (e.g., compressive strength) particularly in the cementitious component. There is also a need for cementitious board panels having improved interfacial binding between the facer material and the cementitious component.

BRIEF SUMMARY OF THE INVENTION

In one aspect, the present invention provides a method of preparing a cementitious article comprising: (a) preparing a cementitious slurry, the cementitious slurry comprising cementitious material, a polyvinyl acetate type polymer, a monobasic phosphate, optionally boric acid, and water; and (b) allowing the slurry to set. In some embodiments where the article is board, the method further comprises depositing the cementitious slurry onto an advancing sheet of facer material. The cementitious slurry can form the core of the article or a dense layer as described below. In some embodiments, the facer material comprises glass fiber, polymer fiber, paper fiber, mineral fiber, organic fiber, or a combination thereof.

In another aspect, the present invention provides a cementitious article comprising: (a) a cementitious component comprising cementitious material, a polyvinyl acetate type polymer, a monobasic phosphate, and optionally boric acid; and (b) a first surface of the component, a second surface of the component, and a central region of the component, overlapping a central axis, halfway between the first surface and the second surface; wherein the total concentration of the polyvinyl acetate type polymer, monobasic phosphate, and boric acid, in each of one or both regions in the component adjacent the first and second surfaces, respectively, is greater than the total concentration of the polyvinyl acetate type polymer, monobasic phosphate, and boric acid in the central region of the component.

In yet another aspect, the present invention provides a cementitious article comprising a cementitious component comprising cementitious material, a polyvinyl acetate type polymer, a monobasic phosphate, and optionally boric acid. The article can be in the form of various board products, with or without lining, or other articles.

These and other advantages of the present invention, as well as additional inventive features, will be apparent from the description of the invention provided herein.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

FIGS. **1**A and **1**B schematically illustrate the cross section of cementitious board in accordance with some embodiments of the invention.

FIGS. **2**A and **2**B schematically illustrate the cross section of cementitious board in accordance with some embodiments of the invention.

FIG. **3** is a graph illustrating the relative amount of the polyvinyl acetate type polymer, monobasic phosphate, and optionally boric acid in various portions of the cementitious board in accordance with some embodiments of the invention.

FIG. **4** is a bar graph illustrating the relative amount of the polyvinyl acetate type polymer, monobasic phosphate, and optionally boric acid in various portions of the cementitious board in accordance with some embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is predicated, at least in part, on the surprising and unexpected discovery of a cementitious